

SRB CRITICAL ITEMS LIST

SUBSYSTEM: RECOVERY

ITEM NAME: Thruster Pressure Cartridge

PART NO.: 10305-0001-801, 10305-0002-801

FM CODE: A03

ITEM CODE: 40-01-04

REVISION: BASIC

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 3

DATE: March 1, 2002

CRITICAL PHASES: Final Countdown,
Boost, Separation

SUPERCEDES: March 31, 1998

FMEA PAGE NO.: C-11

ANALYST: S. Finnegan

SHEET 1 OF 4

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FAILURE MODE AND CAUSES: Premature operation due to structural failure caused by:

- o High Temperature
- o Shock/Vibration
- o Increased sensitivity due to contamination

FAILURE EFFECT SUMMARY: Premature operation of the Thruster Pressure Cartridge will eject the nose cap. During final countdown, impact with the ET and Orbiter is possible leading to loss of vehicle, mission and crew. During boost and separation, abnormal aerodynamic forces on the vehicle or impact of the nose cap with the vehicle will cause loss of vehicle, mission and crew.

RATIONALE FOR RETENTION:

A. DESIGN

- o Design specifications USA SRBE 10SPC-0029 (10305-0001-801) and USA SRBE 10SPC-0231 (10305-0002-801)
 - No autoignition below 275^oF per paragraph 3.2.5.2 for P/N 10305-0001-801 or 245^oF per paragraph 3.2.5.5 for P/N 10305-0002-801 (High Temperature)
 - Shock levels per paragraphs 4.3.8.1 (8-ft.) and 4.3.8.2 (40-ft.) for P/N 10305-0001-801 or per paragraphs 4.3.8.1 (6-ft) and 4.3.8.2 (40-ft) for P/N 10305-0002-801 (Shock)
 - Vibration levels per paragraph 3.4.1.3 for P/N10305-0001-801 or per paragraph 3.4.1.2 for P/N 10305-0002-801 (Vibration)
 - Contamination control per paragraphs 3.1.2 and 3.1.3 (Increased sensitivity due to contamination)
- o Predicted temperature will not exceed 170^oF per SRB Thermal Design Data Book SE-019-068-2H, Table 4.9.1.1. (High Temperature)

- o Explosive material certified to Mil Spec or Source Control Drawing (SCD). (Contamination)
 - Propellant grain Thiokol TP-H-3282C (ammonium perchlorate/PBAN) per Hi-Shear SCD 9391394 (10305-0001-801) or AP/HPTB Universal Propulsion Company (UPCO) Aerospace Drawing 5488108 (10305-0002-801)
 - Pressurizer material (Hi Temp) per Hi-Shear SCD 9391525 (10305-0001-801) or UPCO Aerospace Drawing 5488123 (10305-0002-801)
 - Primer (lead styphnate, antimony sulfate and barium nitrate) per MIL-P-20444 and Hi-Shear SCD 9391395 (10305-0001-801) or UPCO Aerospace (10305-0002-801)
 - Igniter material (BKNO3) per Naval Ordnance Specification WS17360 and Hi-Shear SCD 9391532 (10305-0001-801) or USA SRBE BKN03 Specification 10SPC-0136 and UPCO Aerospace Drawing 5488203 (10305-0002-801)
- o Hermetically sealed device prevents the entry of contamination following manufacturing. (Contamination)
- o Qualification
 - Hi-Shear (10305-0001-801)
 - Demonstrated autoignition temperature (418°F)
 - High temperature functional test (195°F)
 - Vibration
 - UPCO Aerospace (10305-0002-801)
 - Demonstrated autoignition temperature (245 °F)
 - High temperature functional test (190°F)
 - Vibration
- o Qualification test results are documented in Hi-Shear Report 9391387-1370 or UPCO Aerospace Report 10-5488100

B. TESTING

- o Lot acceptance tests are conducted per Hi-Shear Acceptance Test Procedure ATP 9391387-1027 (10305-0001-801) or UPCO Aerospace ATP 7-5488100 (10305-0002-801) (All Failure Causes)
 - Radiographic Tests (X-ray & N-ray) entire lot
 - Leak Test entire lot
 - Vibration all LAT Samples
 - Functional Test - High Temperature (190°F) 5 percent of the lot

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C. INSPECTION

VENDOR RELATED INSPECTION

- o Receiving Inspection. All explosive material certifications and test reports are verified one hundred percent. (Contamination)
 - USA SRBE Quality Assurance
USA SRBE Source Inspection Plan (SIP) 1116
 - Contractor Quality Assurance

- Hi-Shear Corporation Assembly Operation Sheet 9391387-1 and 9391442-1
- UPCO Aerospace Manufacturing procedure 40-5488100, 40-5488120, 40-5488130, 40-5488200

- o Assembly Operation. Moisture content determination, explosive loading, and sealing process are verified and leak test is witnessed one hundred percent by Contractor Quality Assurance, and verified by USA SRBE Quality Assurance. (Contamination)
 - USA SRBE Quality Assurance
 - USA SRBE SIP 1116
 - Contractor Quality Assurance
 - Hi-Shear Corporation Assembly Operation Sheet 9391387-1
 - UPCO Aerospace Manufacturing procedure 40-5488100, 40-5488120, 40-5488130, 40-5488200

- o Lot Acceptance Test. N-ray and X-ray films are examined by certified vendor personnel and verified by USA SRBE personnel. Vibration test is monitored by USA SRBE personnel and leak test and high temperature function test are witnessed one hundred percent. (All Failure Causes)
 - USA SRBE Quality Assurance
 - USA SRBE Source Inspection Plan 1116
 - Contractor Quality Assurance
 - Hi-Shear Assembly Operation Sheet 9391387-1
 - Hi-Shear Acceptance Test Procedure 9391387-1027
 - UPCO Aerospace Manufacturing Procedure 40-5488100, 40-5488120, 40-5488130, 40-5488200
 - UPCO Aerospace Acceptance Test Procedure 7-5488100

- o Lot review and certification per USA SRBE Plan 10PLN-0029.

- o Critical Processes/Inspections. The following critical processes and inspections are used to verify that explosive charge(s) does not contain moisture, contamination, voids, cracks, or improper sealing. (All Failure Causes)
 - X-ray per Hi-Shear ATP 9391387-1027 (10305-0001-801) or UPCO Aerospace Procedure 25-5488100 (10305-0002-801)
 - N-ray per Hi-Shear ATP 9391387-1027 (10305-0001-801) or UPCO Aerospace Procedure 26-5488100 (10305-0002-801)
 - Helium Leak Test per Hi-Shear ATP 9391387-899 (10305-0001-801) or UPCO Aerospace ATP 7-5488100 (10305-0002-801)
 - Adhesive Bonding per Hi-Shear AOS 9391387-1 (10305-0001-801) or UPCO Aerospace Manufacturing Procedure 40-5488100, 40-5488120, 40-5488130, 40-5488200 (10305-0002-801)
 - Gross Leak Test per Hi-Shear ATP 9391387-900 (10305-0001-801) or UPCO Aerospace ATP 7-5488100 (10305-0002-801)

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KSC RELATED INSPECTION

- o Receiving Inspection
 - Damage. Visual inspection of pyrotechnic device for evidence of damage, degradation, corrosion, misalignment or moisture is performed per OMRSD File V, Vol. 1, requirement number B000FL.005. (Contamination)
 - Verify that Thruster Pressure Cartridges have been flight certified by MSFC as required by NSTS 08060 per OMRSD File V, Volume 1, requirement no. B000FL.002. (All Failure Causes)
 - o Installation Inspection
 - Final Ordnance Installation. Inspect O-ring and sealing surfaces, o-ring placement over the output port, and installation per 10REQ-0021, para. 1.1.4.3. (All Failure Causes)
- D. FAILURE HISTORY
- o Failure Histories may be obtained from the PRACA database.
- E. OPERATIONAL USE
- o Not applicable to this failure mode.